

REMARKS/ARGUMENTS

At the outset, Applicants' representative thanks Examiner Kollias for the helpful and courteous discussions held on October 23, 2009 and November 25, 2009, during which the prosecution of the above-identified application was materially advanced. The following remarks will expand and summarize the issues discussed. Throughout the following remarks, reference will be made to the publication of the present application, PGPub US 2006/0116470 ("US '470").

Rejections under 35 U.S.C. § 103(a)

1. The rejection of Claims 16 and 18-20, 24 and 26 under 35 U.S.C. §103(a) as being unpatentable over U.S. 5,934,839 ("*Mallon*") in view of U.S. 5,149,752 ("*Jachowicz*") is respectfully traversed.

The Office considers that *Mallon* discloses processes of making cationic polymers by reacting cationic monomers of various types with water soluble and anionic monomers. Allegedly, this cited reference discloses that the polymerizations occur in the presence of dispersants. However, the Office concedes that *Mallon* does not disclose that the dispersants must be an amphoteric dispersants having an overall negative charge. See the Office Actions mailed December 8, 2008 (*e.g.* see page 3 thereof) and June 22, 2009 (*e.g.* see page 2 thereof). The Office turns to *Jachowicz* and alleges that this cited reference discloses that cationic polymers are made in the presence of negatively charged dispersants (anionic or amphoteric having an overall negative charge), where the dispersants act to stabilize and counteract the positive charge of the cationic polymer made therein. Therefore, the Office considers that it would have been obvious to perform the polymerizations disclosed in *Mallon* in the presence of the negatively charged amphoteric as allegedly disclosed in *Jachowicz*.

At the outset, Applicants note that Claim 16 is amended to define the monomers that are used to form the cationic polymers. In particular the cationic monomers used to form the cationic polymer are not disclosed in *Mallon* or *Jachowicz*. See also claims 34, 35 & 37. Thus, *Mallon* does not disclose the particular cationic polymers of the present claims. Moreover, *Jachowicz* does not disclose the negatively charged amphoteric dispersants of present claim 38. Thus, neither cited reference would suggest that dispersions made thereof would exhibit long-term stability (*i.e.* > 1 month). See claim 36.

In regard to *Mallon*, there is nothing to suggest that the dispersants' charge is critical. In fact, *Mallon* provides for the possibility that cationic polymers can be used as the dispersants:

It is generally preferable for the dispersant to have greater solubility in the particular salt solution than the precipitated polymer droplets which are being dispersed. Cationic polymers e.g. poly(MAPTAC), poly(DMAEA.MeCl), etc. and the like are useful as dispersants when the polymer to be precipitated is less soluble than the dispersant. Copolymers useful as dispersants may include copolymers of nonionic monomers e.g. acrylamide with up to about 99 mole %, preferably up to about 50 mole %, more preferably from about 5 to about 25 mole %, based on the total moles of recurring units in the polymer, of a cationic comonomer e.g. DMAEA.MeCl, DMAEM.MeCl. Other copolymers useful as dispersants include copolymers of acrylamide with up to about 30 mole % of an anionic comonomer...

See Col. 21: 36-55 of *Mallon*. Thus, such a teaching would not lead one of ordinary skill in the art to consider that the charge and/or type of the dispersant is/critical.

Similarly, there is nothing in *Jachowicz* to suggest that an amphoteric dispersant having an overall negative charge would perform any differently than an anionic dispersant. The two types of dispersants are discussed at Col. 9:45 to Col. 10:35; the preferred amounts are the same, the ratios are the same and the amphoterics in particular are not to "interfere with the function of the function of the major components of the composition." See Col. 10:21-22 of *Jachowicz*. Moreover, *Jachowicz* contains no disclosure of the monomers (a') to

(c') that are used to make the negatively charged amphoteric of the present claims (in particular, claim 38). Thus, *Jachowicz* would not teach one of ordinary skill in the art that negatively charged amphoteric would impart longer stability to dispersions of cationic polymers than anionic dispersants (an amphoteric being a dispersant made of positively and negatively charged monomers whereas an anionic being a dispersant made solely of negatively charged monomers), especially the specific negatively charged amphoteric of the present claims.

On the other hand, the present specification notes that the stability of cationic polymers in salt solutions is an issue to be addressed and one that is known in the related art:

Despite efforts to make satisfactory aqueous dispersions, the problem remains of producing aqueous dispersions of water-swellaible and high-molecular weight water-soluble polymers that have advantageously low bulk viscosities (< 10,000 mPas), high solids content (> 20%), that dissolve readily and can be prepared with a broad range of cationicity. Moreover, a major draw-back of the said dispersions is the limited stability. ***The long-term stability (> 1 month) of the dispersions in many embodiments is limited, due to coagulation and/or phase separation.***

See [0010] of US '470, emphasis added. One such related art disclosure is WO 98/14490, which corresponds to *Mallon*, cited against the claims. The present disclosure continues to describe the solution to the problem of stability:

This problem was solved in the present invention by providing novel aqueous dispersions of high-molecular weight cationic water-soluble polymers in the presence of amphoteric protective colloids of the opposite charge, as well as processes for making and methods for using said aqueous dispersions.

See [0011] of US '470. Accordingly, the presence of the negatively charged amphoteric is critical for improving long term stability of the salt dispersions of cationic polymers—there is no disclosure thereof in either *Mallon* or *Jachowicz*.

The examples of the present specification suggest this criticality. It is not sufficient merely to use a dispersant having a negative charge to obtain long term stability of the presently claimed dispersions. As shown in Comparative Example 1, polymerization of vinyl pyrrolidone and dimethylaminoethylmethacrylate-di-ethylsulfate is carried out in the presence of an anionic dispersant. In contrast, the process of Example 3 is the same as that of Comparative Example 1 except for the fact that an amphoteric dispersant with an overall negative charge is used.

Comparative Example 1

[0096] Polymerization of VP and Quat-311 in the Presence of Sodium Sulfate, with an Anionic Dispersant

[0097] Sodium sulfate (77 g), vinylpyrrolidone (128 g), Quat-311 (64 g, 50 wt.-% solution in water) were dissolved in water (300 g). As dispersant, 43 g of poly(maleic acid-co-acrylic acid) (40 wt.-% solution in water, Sokalan CP5) was added. The pH was adjusted to a value of 6.75 with a 5% solution of sulfuric acid and the emulsion was purged with nitrogen gas for ca. 10 minutes. The radical initiator (V-50; 0.24 g) was then added and the reaction mixture was heated to 60° C. under a nitrogen atmosphere. After stirring the mixture at this temperature for 3 hours, a second batch of VA-50 (0.48 g) was added and the mixture was stirred further for 3 hours at 70° C. and then cooled to room temperature. A white suspension was obtained of 23% polymer content and a viscosity of 800 mPas. The emulsion was stable for 5 hours, after which separation occurred.

Example 3

[0114] Polymerization of VP and Quat-311 Using an Amphoteric Dispersant with an Overall Negative Charge

[0115] Sodium sulfate (77 g), vinylpyrrolidone (128 g), Quat-311 (64 g, 50 wt.-% solution in water) were dissolved in water (347 g). As dispersant, 63 g of poly(vinylamine-co-acrylic acid=1:9 mol:mol) (28 wt.-% solution in water) was added. The pH of was adjusted to a value of 6.75 with a 50% solution of sulfuric acid and the emulsion was purged with nitrogen gas for ca. 10 minutes. The radical initiator (V-50; 0.48 g) was then added and the reaction mixture was heated to 60° C. under a nitrogen atmosphere. After stirring the mixture at this temperature for 3 hours, a second batch of VA-50 (0.96 g) was added and the mixture was stirred further for 3 hours at 70° C. and then cooled to room temperature. A white suspension was obtained of 23% polymer content and a viscosity of 3500 mPas. The stability of the emulsion was examined over a period of 2 months upon which no separation was observed.

As can be seen in Table 1 shown below (emphases added)

TABLE 1

Examples of water-in-water emulsion polymerisation						
Example	Monomer 1 (wt.-%)	Monomer 2 (wt.-%)	Dispersant	Crosslinker*	Viscosity Emulsion (mPas) [§]	Stability duration
C1	80 VP	20 Quat 311	Sokalan CP 5	—	800	<1 day
C2	80 VP	20 Quat 311	Sokalan PA 80	—	850	<1 day
C3	80 VP	20 Quat 311	Catiofast PR8106	—	100	<1 day
C4	80 VP	20 DADMAC	Catiofast PR8106	PETEA	100	<1 day
C5	80 VP	20 QVI	Sokalan PA 80	TAA	<100	<1 day
C6	80 VP	20 QVI	Catiofast PR8106	TAA	100	<1 day
C7	80 VP	20 QVI	Poly(vinylamine-co-acrylic acid) of 9:1 (mol:mol)	TAA	1500	<1 day
3	80 VP	20 Quat 311	Poly(vinylamine-co-acrylic acid) of 1:9 (mol:mol)	—	3500	>2 months
4	80 VP	20 Quat 311	Poly(vinylamine-co-acrylic acid) of 3:7 (mol:mol)	—	1650	>2 months
5	80 VP	20 Quat 311	Poly(vinylamine-co-acrylic acid) of 2:8 (mol:mol)	—	100	>2 months
6	80 VP	20 DADMAC	Poly(vinylamine-co-acrylic acid) of 2:8 (mol:mol)	PETEA	1250	>2 months
7	80 VP	20 QVI	Poly(vinylamine-co-acrylic acid) of 1:9 (mol:mol)	TAA	1100	>2 months
8	72 VFA	27 QVI	Poly(acrylic acid-co-DMAEA.MeCl) of 55:45 (mol:mol)	—	2900	>1 month
9	80 VFA	20 DADMAC	Poly(acrylic acid-co-DMAEA.MeCl) of 55:45 (mol:mol)	—	7000	>1 month
10	90 VFA	10 DMA3	Poly(acrylic acid-co-DMAEA.MeCl) of 55:45 (mol:mol)	—	6000	>1 month

the dispersion of Comparative Example 1 had a stability of less than one day. On the other hand, the dispersion of Example 3 had a stability of greater than two months. These results

suggest that the opposite charge of the dispersant, *i.e.*, the anionic dispersant used in Comparative Example 1, does not by itself induce long-term stability, which is contrary to the Office's allegation. Thus, Applicants have demonstrated that the negatively charged amphoteric dispersants are necessary for inducing long term stability of salt dispersions of cationic polymers.

Moreover, the make-up of the negatively charged amphoteric dispersants is not necessarily critical (so long as the dispersants have a negative charge). The same polymerization of Example 3 was carried out in Examples 4 & 5 with the exception that different negatively charged amphoteric dispersants were used. Long-term stability was also achieved in Examples 4 & 5 (greater than two months). Thus the charge of the negatively charged amphoteric dispersants is critical, not the make-up.

As noted above, *Mallon* does not disclose that negatively charged amphoteric dispersants **must** be used to make cationic polymer salt dispersions, nor suggest that the stability thereof can be improved by using such dispersants. There is no teaching in *Jachowicz* that would lead one of ordinary skill in the art to select negatively charged amphoteric dispersants over anionics (especially the negatively charged amphoteric dispersants of the present claims), and that the negatively charged amphoteric dispersants would induce longer term stability. Therefore, one of ordinary skill in the art would not be led to the presently claimed processes upon considering the disclosures of *Mallon* and *Jachowicz*, either individually or combined.

Accordingly, the rejection is no longer tenable and should be withdrawn.

2. The rejection of claim 17 under 35 U.S.C. §103(a) as being unpatentable over *Mallon* in view of *Jachowicz* and U.S. 5,470,903 ("*Lenney*") is respectfully traversed for the same reasons given above. Like *Jachowicz*, *Lenney* does not address the deficiencies of *Mallon* such that one of ordinary skill in the art would arrive at the presently claimed invention upon

considering these references. Accordingly, the rejection is no longer tenable and should be withdrawn.

3. The rejection of claims 21-23, 25, 27 and 30 under 35 U.S.C. §103(a) as being unpatentable over *Mallon* in view of *Jachowicz* and WO 1999/46207 ("*Huang*") is respectfully traversed for the same reasons given above. Like *Jachowicz*, *Huang* does not address the deficiencies of *Mallon* such that one of ordinary skill in the art would arrive at the presently claimed invention upon considering these references. Moreover, *Huang* is also discussed by the Applicants in the related art section; thus, the stability problem discussed above in the case of *Mallon* equally applies to *Huang*. Accordingly, the rejection is no longer tenable and should be withdrawn.

4. The rejection of claims 28-29 under 35 U.S.C. §103(a) as being unpatentable over *Mallon* in view of *Jachowicz* and U.S. 4,806,435 ("*Bhattacharyya*") is respectfully traversed for the same reasons given above. Like *Jachowicz*, *Huang* does not address the deficiencies of *Mallon* such that one of ordinary skill in the art would arrive at the presently claimed invention upon considering these references. Accordingly, the rejection is no longer tenable and should be withdrawn.

Conclusion

Applicants respectfully submit that the above-identified application is in condition for allowance. Notification thereof is requested.

Respectfully submitted,

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